

Remarks

I. Introduction

This is in response to the Office Action dated January 5, 2010.

The Office Action rejected claims 1-3, 5-15, 18-19, 21-26, 29, and 31-32 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,996,828 (Kimura) in view of United States Publication No. 2004/0088710 (Ronkka). The Office Action rejected claims 17 and 20 under 35 U.S.C. § 103(a) as being unpatentable over Kimura in view of Ronkka, and further in view of Halang, "Real-time Systems" pages 291-313 (Halang). The Office Action rejected claims 27 and 28 under 35 U.S.C. § 103(a) as being unpatentable over Kimura in view of Ronkka, and further in view of U.S. Patent no. 6,725,260 (Philyaw). The Office Action rejected claims 16 and 30 under 35 U.S.C. § 103(a) as being unpatentable over Kimura in view of Ronkka, and further in view of U.S. Publication no. 2003/0041088 (Wilson)

Claims 1-3 and 5-32 are pending.

II. Rejections under 35 U.S.C. §103(a)

Independent claims 1, 14, 22, and 32 were rejected as being unpatentable over Kimura in view of Ronkka. In order to "establish *prima facie* obviousness of a claimed invention, all claim limitations must be taught or suggested by the prior art." In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Furthermore, "all words in a claim must be considered in judging the patentability of that claim against the prior art." In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). See also MPEP § 2143.03. The cited references, either alone or in combination, do not disclose all of the claim limitations of independent claims 1, 14, 22, and 32. Therefore, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. §103(a).

The present invention relates to a system and method for automatically reassigning an interface card and devices associated with a programmable logic controller system from a first operating environment to a second operating environment. In particular, the specification describes a method for adequately allocating resources between the operating environments that control the industrial machinery, thereby providing greater assurance of adequate response times to the controlled devices. As described at page 19, lines 5-11, in response to an interface being selected in a first operating environment and a virtual slot being selected in a second operating environment, an installation file is created for installation of the interface in the second operating environment. The interface is then installed in the second operating environment using the installation file. This reassigns resources from the first operating environment to the second operating environment.

As described in the specification starting on page 6, line 22, a PC-based Programmable Logic Controller (PLC) environment includes a computer that controls several industrial devices in a manufacturing environment. As shown in Figure 1, the PLC interfaces with these industrial devices via expansion cards. The structure of PLC communications to the various industrial devices, disclosed on page 7, line 17, is based on a "scan cycle", which is a cycle of communication to all industrial devices that are interfaced to the PLC.

Page 6, lines 10-20 of the specification describes how the demands on the PLC operating system may increase, usually as a result of the addition of industrial devices to the PLC. An increased demand for PLC real-time processing could adversely impact the PLC's efficiency and response times to the industrial devices under its control. As a result, the additional demands on the PLC may vary or delay the cycle of communications from the PLC to the industrial devices. A variance in the scan cycle timing could have a detrimental effect on the manufacturing operations of the industrial devices that require immediate processing.

Page 7, line 21 discloses one aspect of the invention. The operating system for a PC-based PLC is migrated to an environment where the scan cycle timing is not variable. A PLC operating environment with non-variable scan cycle timing provides greater assurance that the resources for the PLC will be adequately provided during the times of peak servicing and control of the industrial devices.

The above described aspects of the present invention are reflected in independent claim 1. In particular, independent claim 1 recites the limitations "creating a first installation file in the first operating environment for installation of the first interface in the second operating environment," "installing the first interface in the second operating environment using the first installation file to reassign a resource between the first operating environment and the second operating environment, an interrupt line of the reassigned resource shared in the second operating environment with at least one real-time card," and "wherein said second operating environment has non-variable scan cycle timing".

The combination of Kimura and Ronkka does not disclose these limitations of independent claim 1.

Kimura discloses a method for multi operating system configuration on a single computer. Kimura, at column 2, lines 32-44, discloses the division of the computer's physical memory for each of a plurality of operating systems, thereby enabling a single computer to run a plurality of operating systems. In particular, in Kimura, a multi-OS management program uses a memory area that is shared by all of the OSs so that the multi-OS management program has the same virtual address in any OS. However, there is no description in Kimura of an installation file being created in one operating system for installation of an interface in another operating system. Therefore, Kimura fails to disclose "creating a first installation file in the first operating environment for installation of the first interface in the second operating environment," as recited in independent claim 1.

The Office Action alleges that the limitation of "creating a first installation file in the first operating environment for installation of the first interface in the second operating environment" is taught by "object file name, fig. 10 and associated text" of Kimura. However, FIG. 10 and the associated text of Kimura are directed to "a flow chart showing a loading processing procedure of the device driver executed by the first OS already started." (Kimura, col. 9, lines 44-46). Although col. 9, line 49-51 of Kimura mention an "object file name", this is the object file name of the device driver being loaded by the first operating system. The object file name is not an installation file for installation of an interface into the second operating system. There is no description in Kimura of the first operating system creating an installation file for installing an interface in the second operating system. Therefore, Kimura fails to disclose "creating a first installation file in the first operating environment for installation of the first interface in the second operating environment," as recited in independent claim 1. Ronkka also fails to disclose this limitation of independent claim 1.

As described at col. 13, lines 6-13, an address of an interrupt handler for the first OS is changed to the address of the interrupt table assigned to the multi-OS driver. However, there is no description in Kimura of installing an interface from the first operating system in the second operating system using an installation file created in the first operating system and sharing an interrupt line of a reassigned resource in the second operating system with a real-time card. Therefore, Kimura fails to disclose "installing the first interface in the second operating environment using the first installation file to reassign a resource between the first operating environment and the second operating environment, an interrupt line of the reassigned resource shared in the second operating environment with at least one real-time card," as recited in independent claim 1. The Office Action admits that Kimura does not teach a real-time card and relies on Ronkka as teaching a real-time card. However, even if Ronkka does teach a real-time card, the combination of Kimura and Ronkka does not teach an interrupt line of a resource reassigned from a first operating environment to a second operating environment being shared with a real-time card. Therefore, the

combination of Kimura and Ronkka fails to disclose "installing the first interface in the second operating environment using the first installation file to reassign a resource between the first operating environment and the second operating environment, an interrupt line of the reassigned resource shared in the second operating environment with at least one real-time card," as recited in independent claim 1.

The Office Action admits that Kimura does not disclose the limitation of "said second operating environment has non-variable scan cycle timing" as claimed in claim 1.

Ronkka is directed to a communication device with a processor that runs multiple operating systems. As described at paragraph [0060], one operating system relates to running mobile station functions, and the other operating system relates to running data processing functions. As described at paragraphs [0060] and [0085] of Ronkka, one of the operating systems can be a real time operating system that has certain execution time requirements. As described at paragraphs [0002] and [0003] of Ronkka, an advantage of real time operating systems over non-real time operating systems is that a response time for external interrupts can be predicted in real time operating systems. Although Ronkka describes the use of a real time operating system, Ronkka does not describe any non-variable scan cycle timing in such a real time operating system. As described above, a scan cycle is a cycle of communication to all industrial devices that are interfaced to the PLC. Although paragraph [0003] of Ronkka describes predictable response time and execution speed of a real time operating system, there is no description in Ronkka of a non-variable cycle of communication to industrial devices interfaced to the operating system.

In the Office Action, the Examiner states that "timer for OS_A so called real-time operating system can not be lengthen [sic] or have been determined, 0003, 0060, 0085". While these cited portions of Ronkka describe responses times can lengthen in non-real time operating systems, as compared with real

time operating systems, and that response times can be determined in the kernel of real time operating systems, these cited portions of Ronkka do not contain any description of the real time operating system having a non-variable scan cycle. A real-time operating system is not the same as an operating environment with non-variable scan cycle timing. Ronkka does not disclose the use of such non-variable scan cycle timing.

In the response to arguments section of the Office Action, the Examiner states that "With real-time operating system (RTOS), the response time of the executing task is predicting/nonvariable/fixed/determined/not be lengthen [sic]. Each response time for each task is scan cycle timing, and since the response time is predicting [sic], it is non-variable." Applicants point out that Ronkka does not state that the real-time operating system has a non-variable or fixed response time. The Examiner seems to rely on the statement in paragraph [0003] of Ronkka that in multi-tasking non-real time operating systems, "response times can lengthen" to assert that response times in real-time operating systems "cannot be lengthen[ed]". However, there is no support for this assertion Ronkka. As described in paragraph [0002] of Ronkka, response times for external interrupts can be predicted. The Examiner seems to conclude that since a response time can be predicted, it is non-variable. However, the fact that a time can be predicted does not mean that the time cannot vary. Ronkka does not disclose the use of non-variable scan cycle timing. Therefore, Kimura and Ronkka, separately or in combination, do not disclose "said second operating environment has non-variable scan cycle timing" as claimed in claim 1.

For the reasons described above, Kimura and Ronkka, separately or in combination, do not disclose each and every limitation of independent claim 1. Therefore, independent claim 1 is allowable over the cited art.

For the reasons discussed above in connection to independent claim 1, the cited art does not disclose the limitations of "assigning the resource for operation in the second processing mode by using installation parameters

associated with the first processing mode, an interrupt line of the assigned resource shared in the second processing mode with at least one real-time card" and "wherein said second processing mode has non-variable scan cycle timing," as recited in independent claim 14.

For the reasons discussed above in connection to independent claim 1, the cited art does not disclose the limitations of "a means for creating an installation file in the first operating environment of the soft PLC for installation of the first interface in the second operating environment of the soft PLC," "a means for installing the first interface in the second operating environment of the soft PLC using the installation file to reassign a resource between the first operating environment of the soft PLC and the second operating environment of the soft PLC, said system adapted to utilize said resource in the soft programmable logic controller (PLC), an interrupt line of the reassigned resource shared in the second operating environment with at least one real-time card," and "wherein said second operating environment has non-variable scan cycle timing," as recited in independent claim 22.

For the reasons discussed above in connection to independent claim 1, the cited art does not disclose the limitations of "a third software component to create an installation file in the first operating environment of the soft PLC for installation of the interface in the second operating environment of the soft PLC," "a fourth software component to install the interface in the second operating environment of the soft PLC using the installation file to reassign a resource between the first operating environment of the soft PLC and the second operating environment of the soft PLC, an interrupt line of the reassigned resource shared in the second operating environment with at least one real-time card," and "wherein said second operating environment has non-variable scan cycle timing" as recited in independent claim 32.

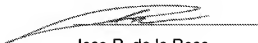
Thus, independent claims 14, 22, and 32 are allowable over the cited art.

All remaining claims are dependent upon an allowable independent claim and are therefore also allowable.

III. Conclusion

For the reasons discussed above, all pending claims are allowable over the cited art. Reconsideration and allowance of all claims is respectfully requested.

Respectfully submitted,



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